

Wrap Up for Terrestrial Carbon Cycle Science

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Terrestrial carbon session: Objective

To discuss how to:

‘capitalise on the increasing satellite observation capacity, together with numerical models, in-situ networks, and novel technologies, for a better understanding and quantification of the carbon cycle, its pools and fluxes and their sensitivity to climate change’

With special attention to the land biosphere and a carbon-neutral society - including the natural ecosystems, land use & agriculture and forests.



Terrestrial carbon session: Numbers



- 52 Attendees
- 9 Posters
- 2 Keynote speakers
- 5 Oral Presentation and 2 Discussion Sessions
- 29 Presentations (22 ESA and 7 Horizon Europe)
- 4 ESA Living Planet Fellowship presentations



ESA Carbon Science Cluster Themes





Carbon RO2 Land Use and Land Use Dynamics – Theme 1 (ITT Closed)

Carbon RO2 Benchmarking – Theme 2 (ITT closed)

Carbon RO3 Arctic Wetlands (Q1 2024)

Carbon RO4 Terrestrial Carbon Challenge – ESA-NASA Coordination (Q2 2024)

Carbon RO5 HR Assessment of the Terrestrial Carbon Cycle (Q3-Q4 2024)

Check EOP website for news, ESA-STAR and request to be on Carbon Cluster email list

<https://eo4society.esa.int/communities/scientists/esa-carbon-science-cluster/4>



Calls under Earth System Science Initiative

- ***HORIZON-CL5-2024-D1-01-07 Quantification of the role of key **terrestrial ecosystems in the carbon cycle** and related climate effects.***
- ***HORIZON-CL5-2024-D1-01-02 Inland ice, including snow cover, glaciers, ice sheets and **permafrost**, and their interaction with climate change.***
- ***HORIZON-CL5-2024-D1-01-01 Enhanced quantification and understanding of **natural and anthropogenic methane emissions and sinks*****

https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-8-climate-energy-and-mobility_horizon-2023-2024_en.pdf

Terrestrial Carbon Session: Keynote

- There are different views of the carbon cycle - stocks, fluxes, atmosphere change but they should ‘converge’
- In situ very rich and valuable but representativeness is an issue (distribution, bias). Satellites offer an alternative different insight
- New approaches needed beyond the ‘classic’ methods (atmospheric inversion, classic vegetation modelling) – hybrid approaches using acquired knowledge and ML/deep learning at different levels built on observations in combination
- High resolution observations needed and improvement in data/product latency and accessibility
- **ESA good for satellite data effort, EC for model, in situ and Deep Learning – happy match**



Practical implementation issues for carbon



Short term/Immediate needs:

Carbon community cohesion

- Communications and partnerships across projects, EC-ESA – very challenging to understand all the activity, opportunities
- Connection to other clusters – biodiversity, polar, hydrology, agriculture
- Preparing for the future: Connection to new missions (biomass), building research infrastructures (e.g. GEO-Trees)

Recommendation:

Establishment of an ESA-EC Carbon-Network, Central coordination with funding support and community buy-in.



Medium Term Needs - Infrastructure and People

- Legacy is important not just for data
 - Continuity of infrastructure – upgrade/supersites/rapid deployment/campaigns
 - Investment in people (involvement of next generation is a major limitation)
 - How can we improve/link fellowship schemes (Marie Curie, Living Planet Fellowships, Science Hub) e.g. new mechanisms for ECR funding and coordination
- There is a lot to learn from international partners
 - How can especially southern hemisphere be engaged e.g. Fellowships etc
- How can we improve (for carbon) engagement for impact – from interesting science to policy, society relevance
- How to support sciences beyond Europe
 - Why does the applicant have to be a European national? --> host institution
 - Requirement to go back to native countries needs 2 phases of funding (1 year in Europe, 1 year in local host institutions?)



Medium Term Needs - Administrative

- Linking projects and calls
 - There are already nascent links e.g. NRT-Extremes, CAMS, Sense4Fire – can we help institutionally or should this be ‘organic’
 - Challenging to find information about ongoing projects and both EC and ESA calls. Too many websites, too many clicks. Several programmes exist but visibility is an issue
 - Admin burden of ESA vs EU: generally OK, interaction with Project Officers quite good but short-term projects (2 year) not very appealing to new candidates -> ECS to be co-Is?
- New mechanisms
 - Joint EC-ESA calls might be more sensible but practical barriers and different time-scales of funding schemes are quite complementary
 - Dedicated funding lines with emphasis encouraging interaction across clusters as well as EC-ESA
- Multi-agency activities
 - How can joint ESA - other agency calls be improved?



Central information point would be very useful

- needs to be coordinated and kept up-to-date
- requires funding --> would the community buy in?